AMENDMENTS TO THE DRAWINGS

The attached drawing sheet includes changes to the drawing sheet which originally showed only Fig. 3. The attached sheet, which now include both Fig. 3 (as originally filed) and additional Fig. 4, replaces the original sheet including only Fig. 3. A discussion showing enablement of additional Fig. 4 is included in the Remarks below.

Attachments: Annotated Sheet Showing Change

REMARKS/ARGUMENTS

By this Amendment, claims 1, 3, 4 and 6 are amended. No claims are canceled. Claims 1-28 are pending.

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

The Examiner sets forth that Applicants' claim for the benefit of a prior-filed PCT is acknowledged, that acknowledgment is made of Applicants' claim for foreign priority under 35 U.S.C. 119(a)-(d) and that the certified copy has been filed on December 16, 2004. The Examiner also sets forth that the Information Disclosure Statement submitted on December 16, 2004 has been considered and made of record by the Examiner.

Examiner's Objection to the Drawings

According to the Examiner, the drawings are objected to under 37 CFR 1.83(a). The Examiner sets forth that the drawings must show every feature of the invention specified in the claims and therefore, the equalization and demodulation, as cited in claim 1, must be shown or the feature(s) canceled from the claim(s). The Examiner directs the Applicants' attention to the fact that no new matter should be entered.

According to the Examiner, corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office Action to avoid abandonment of the application and that any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The Examiner further sets forth

that the figure or figure number of an amended drawing should not be labeled as "amended" and if a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures according to the Examiner according to the Examiner. The Examiner sets forth that each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d) and if the changes are not accepted by the Examiner, the Applicants will be notified and informed of any required corrective action in the next Office Action according to the Examiner. The Examiner further sets forth that the objection to the drawings will not be held in abeyance.

Applicants' Response to Examiner's Drawing Rejection

Accordingly, the Applicants submit herewith informal Figure 4 for the Examiner's consideration. Fig. 4 shows a block diagram representation of equalization and demodulation based upon the scatterer-coefficients measured in the receiver as set forth in claim 1.

Enablement for additional Fig. 4 is shown in the specification starting at page 2, line 27-page 3, line 11 which sets forth:

> The object of the present invention is therefore to provide a method for equalizing and demodulating a data signal transmitted via a time-

> variant transmission channel of this kind, which avoids the above disadvantages and limitations regarding the properties of the channel.
>
> . . .
>
> With the method according to the invention, the channel impulse is no longer used for channel estimation. Instead, the so-called scatterer-coefficients, that is to say, a complex-valued attention, the delay and the Doppler shift in the channel, are used.

Enablement for Fig. 4 is also shown on page 3, lines 19-27.

> Scattering coefficients in the new data, which are attributable to the scatterer, can be determined in the receiver, and the distorted data signal can then be equalized and finally demodulated. According to the invention, the channel properties are therefore defined by these scatterer coefficients, which can be determined in a simple manner from the distorted data signals received on the basis of the following description.

Additionally, Fig. 4 is, of course, enabled in the originally filed claim 1, set forth on page 15 of the originally filed specification lines 4-12 which recites:

> 1. Method for equalizing and demodulating a data signal transmitted via a time-variant channel to a receiver,
>
> **characterized in that**

> The scatterer coefficients (attenuation, delay and Doppler frequency) in the received data signal, which cause signal distortion in the channel, are measured in the receiver, and that the data signal is equalized and then demodulated with them.

At such time as the Examiner notifies the Applicants that the Examiner believes that (1) the additional Fig. 4 meets the requirements under 37 CFR 1.83(a), and (2) the additional Fig. 4 is enabled by the originally filed specification, the Applicants will provide a formal drawing sheet showing Fig. 3 as originally filed as well as the additional Fig. 4 as approved by the Examiner.

Examiner's Rejections under 35 U.S.C. 112

The Examiner sets forth that claims 1-28 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The Examiner further sets forth that the claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As to claim 1, the Examiner believes that Applicants recite that the scatterer coefficients include attenuation, delay and Doppler frequency. However, the Examiner believes that in the invention disclosure Applicants disclose that the scatterer matrix includes scatterer coefficients M and K, which represent standardized delay and standardized Doppler shift, respectively according to the Examiner (the Examiner directs the Applicants' attention to page 4, lines 8-18). According to the Examiner, in this matrix there is no coefficient defined for attenuation of the signal and

furthermore that Applicants disclose, that the coefficients of the matrix represent the complex-valued attenuation values (the Examiner directs the Applicants' attention to page 4, lines 14-16). However, it is not clear to the Examiner whether M and K represent attenuation, or there are other coefficients, which represent the attenuation of signal.

The Examiner further sets forth that claim 1 recites the limitation "the scatterer coefficients," on line 3 and that there is insufficient antecedent basis for this limitation in the claim.

The Examiner also further sets forth that claims 3, 4 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. As to claims 3, 4 and 6, the Examiner believes that limitation "wherein its use" is vague and indefinite. Because "its" does not point out to any specific limitation.

Applicants' Response to Examiner's Rejections under 35 U.S.C. 112

With respect to claim 1, the Examiner is correct in determining that the parameter m represents the standardized delay and that the parameter k represents the Doppler shift, thereby disclosing these two scatterer-coefficients of the claimed invention. However, the Applicants respectfully submit that the same section of the disclosure also discloses a third scatterer-coefficient, the attenuation scatterer-coefficient S(m,k). The Examiner will note that the quantity S(m, k) is itself the scatterer-coefficient for attenuation as set forth in the Applicants' claim 1.

At page 4, lines 11-19 of the Specification the Applicants disclose:

> On the basis of a two-dimensional field, Figure 1 shows the discretisation of the Doppler frequency with f_d and the delay τ in the transmission channel for various scatterers. This graphic representation can be directly converted into a scatterer matrix S with a scatterer coefficients S(m,k), as used in the following equations (1) to (4). The coefficients of the matrix S represent the complex-valued attenuation values (amplitude and phase).

Thus, the Specification discloses the three scatterer coefficients set forth in claim 1: S(m,k), m, and k.

Additionally, claim 1 is amended to address the antecedent basis concerns raised by the Examiner.

Examiner's Rejection Under 35 USC 103

The Examiner sets forth that claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Generation of Scattering Functions by Computer Simulation for Mobile Communication Channels," Vehicular Technology Conference, 1996. 'Mobile Technology for the Human Race,' IEEE 46th; Publication Date: 28 April - 1 May 1996, Volume: 3, on pages: 1443-1447 vol. 3), in view of Wiedeman et al. (hereafter referred as Wiedeman) (US 5,796,760).

As to claim 1, the Examiner believes that Wang discloses a data signal transmitted via a time-variant channel to a receiver (the Examiner directs the Applicants' attention to page 1443), wherein scatter coefficients including attenuation (the Examiner directs the Applicants' attention to page

1444, left column), delay and Doppler frequency (the Examiner directs the Applicants' attention to page 144, right column) in the received data signal, which cause signal distortion in the channel, are measured in the receiver (the Examiner directs the Applicants' attention to pages 1443 and 1444). According to the Examiner, although Wang does not disclose that the signal is transmitted using a single-carrier or multi-carrier, in order to transmit the signals from transmitter to the receiver, the Examiner believes that inherently, there must be at least one carrier (single carrier).

The Examiner further believes that Wang discloses all the subject matter claimed in claim 1, except that the Examiner believes that the data signal is equalized with the scatterer coefficients and then demodulated with them. The Examiner further believes that Wiedeman discloses a receiver apparatus comprising an equalizer and a demodulator, wherein the equalizer equalizes a Doppler frequency offset (interpreted by the Examiner as the first scatterer coefficient) for each correlated signal and the delay (interpreted by the Examiner as the second scatterer coefficient) of each of the correlated signals (the Examiner directs the Applicants' attention to column 15, last paragraph). The Examiner believes that Wiedeman further discloses that the receiver includes circuitry for combining together all equalized correlated signals to provide a demodulator with a composite received signal (the Examiner directs the Applicants' attention to column 15, last paragraph).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang as suggested by Wiedeman in order to transmit the majority of the signal over the communication path (or paths) which are capable of conveying a highest

quality signal (the Examiner directs the Applicants' attention to column 16, first paragraph) and as the result increase the performance of the receiver.

The Examiner sets forth that claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Wiedeman, further in view of Borowski (US 3,997,841).

As to claim 2, the Examiner sets forth that Wang discloses that the measurement of the scatterer coefficients has been taken place in the time domain (the Examiner directs the Applicants' attention to the Abstract and page 1443, right column). According to the Examiner, Wang and Wiedeman disclose all the subject matters claimed in claim 2, except that the equalization of the data signal takes place within the time domain and the Examiner believes that Borowski discloses that the advantages of the time-domain equalizers are that sufficient noise suppression can be achieved, which permits the use of a low-noise amplifier with sufficient control range (the Examiner directs the Applicants' attention to column 1, paragraph 4) according to the Examiner.

Therefore, the Examiner believes that for the reasons stated above, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang and Wiedeman to use a time domain equalizer to equalize the data signal.

The Examiner sets forth that claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Wiedeman, further in view of Schenk et al. (hereafter referred to as Schenk) (US 6,647,076).

As to claim 5, the Examiner further sets forth that Wang discloses that the measurement of the scatterer coefficients has been taken place in the frequency domain (the Examiner directs the

Applicants' attention to the Abstract and page 1443, right column). According to the Examiner, Wang and Wiedeman disclose all the subject matter claimed in claim 5, except that the equalization of the data signal takes place within the frequency domain and Schenk discloses that a frequency domain equalizer is used for the channel equalization of a signal vector (the Examiner directs the Applicants' attention to column 5, lines 35-40). The Examiner believes that Schenk further discloses that the frequency domain equalizers require a smaller outlay on circuitry than time domain equalizers and can be implemented as a simple and fast algorithm and as a simple circuit (the Examiner directs the Applicants' attention to column 2).

Therefore, the Examiner believes that for the reasons stated above, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang and Wiedeman to use a frequency domain equalizer to equalize the data signal.

The Examiner sets forth that claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Wiedeman, further in view of Ratnarajah et al. (hereafter referred to as Ratnarajah) (US 6,757,339).

The Examiner further sets forth that as to claim 9, Wang and Wiedeman disclose all the subject matters claimed in claim 1, except that a first measurement of the scatterer coefficients is implemented with the assistance of a known data sequence. The Examiner believes that Ratnarajah discloses a method for estimating the sequence of transmitted symbols in a digital communication system (the Examiner directs the Applicants' attention to the Abstract). The Examiner further believes that Ratnarajah discloses that the channel impulse response coefficients (i.e. interpreted as

scatterer coefficients) are determined from training symbols embedded in the transmitted data sequence (the Examiner directs the Applicants' attention to column 1, lines 37-49). The Examiner believes that it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang and Wiedeman as suggested by Ratnarajah, to more accurately determine the coefficients.

Applicants' Response to Examiner's Rejection Under 35 U.S.C. 103

The Applicants' invention is a system for equalizing and demodulating a received data signal that has been transmitted via a time-variant channel. In the Applicants' invention, scatterer coefficients determined from the received data signal are used for the equalization and demodulation of the received signals.

In the prior art methods for equalizing and demodulating of the data signals cited by the Examiner, estimation of the channel impulse response as a function in the time domain and/or in the spectral domain were required. Obtaining the channel impulse response in this manner was a very complicated procedure, for example requiring a number of training sequences.

According to the present invention, the prior art channel impulse response (and thus the complicated process for obtaining it) is no longer used. Rather, the invention uses the scatterer-coefficients obtained from the received data signals for this purpose. Thus, the claimed method eliminates the need for the complicated estimation procedures of the prior art.

The Wang reference cited by the Examiner describes the determination of scatterer-coefficients by computer simulation. However, Wang does not disclose or suggest that the scatterer-

coefficients determined in this manner can be used for equalizing and demodulating the data signals transmitted via a time-variant channel to a receiver as required by claim 1.

The Wiedeman reference cited by the Examiner describes the so called rake-receiver which includes multiple channels. In the description disclosed by Wiedeman in column 7, line 57 and the end of column 15, all paths are assumed to be constant and therefore all the output signals can be combined. This combiner of Wiedeman is thus a so called maximum ratio combiner. There is no teaching or suggestion in Wiedeman's combiner that a receiver receiving data signal transmitted via a single carrier of a multi-carrier date-transmission on a time-variant channel can use the scatterer-coefficients for equalizing and demodulating the received data signal.

Therefore, neither Wiedeman or Wang suggests the method of the invention. Furthermore, the combination of Wiedeman and Wang does not suggest the invention. Additionally, as previously described, the method according to the invention is much easier to use than the prior art methods. A further advantage of the Applicants' invention is that it can be used with fast changing channels whose channel impulse response is not constant over a transmitted symbol.

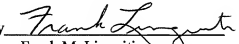
For at least the reasons set forth above, it is respectfully submitted that the above-identified application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are respectfully requested.

Should the Examiner believe that anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

CAESAR, RIVISE, BERNSTEIN,
COHEN & POKOTILOW, LTD.

October 24, 2007

By 
Frank M. Linguiti
Registration No. 32,424
Customer No. 03000
(215) 567-2010
Attorneys for Applicants

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